(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 070 099**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 82303042.4

(22) Date of filing: 11.06.82

(51) Int. Cl.³: F 16 D 13/68

(30) Priority: 14.07.81 GB 8121678

(43) Date of publication of application:
19.01.83 Bulletin 83/3

(84) Designated Contracting States:
BE DE FR GB IT SE

(71) Applicant: AUTOMOTIVE PRODUCTS PUBLIC LIMITED COMPANY
Tachbrook Road
Leamington Spa Warwickshire CV31 3ER(GB)

(72) Inventor: Burke, John Pius
27 Acacia Road
Leamington Spa Warwickshire(GB)

(74) Representative: Farrow, Robert Michael
Patent Department Automotive Products plc Tachbrook Road
Leamington Spa Warwickshire CV31 3ER(GB)

(54) **Friction clutch driven plate.**

(57) A motor vehicle friction clutch driven plate having a hub (11) and a facing carrier (16) (19) mounted on the hub and capable of limited rotation about the hub (11). Resilient damping members (21) act between the hub and carrier for damping out drive load oscillations and an auxiliary resilient damping members (25) also acts between the hub and carrier to damp out idling loads. The resilient damping members (21) are each a snug fit in either the hub (11) or carrier (16) (19) and a loose fit in the other (11) or (16) (19). The auxiliary damping member (25) is arranged end to end with at least one of the resilient means (21) to bias said resilient member (21) ('B') towards one end of its aperture in which it is a loose fit.

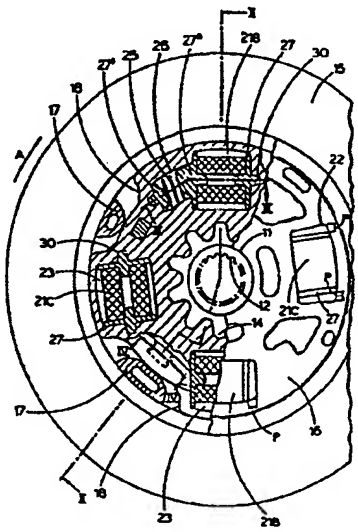

Fig.1

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"Friction Clutch Driven Plate"

This invention relates to friction clutch driven plates for, but not exclusively for, use in automobile friction clutches.

In automobile clutches it is well known to provide a clutch driven plate with resilient members which act between a driven plate hub and a friction facing carrier rotatably mounted thereon to resist relative rotation therebetween. Further it is known to provide a light rate spring, or auxiliary spring, for damping out light loads caused by vibrations in the vehicle drive line when the transmission is idling and to have high rate springs for damping out torque variations in the transmission when the transmission is under a drive load. An example of this construction is shown in British Patent No. 1 233 273, in which the auxiliary vibration damping springs are arranged in a vibration member hub co-axially mounted within a main hub. The auxiliary springs act in series with the main damping springs.

The herein disclosed driven plate provides a much simplified construction having an auxiliary vibration damping means acting in series with main resilient damping means.

Accordingly, there is provided a friction clutch driven plate having a hub with a flange thereon, a co-axial friction facing carrier mounted on the hub and capable of limited angular rotation about the hub, and circumferentially acting main resilient members each located in a respective set of aligned apertures in the flange and carrier to resist said rotation, said resilient members each being a snug fit in its respective aperture in one of the hub and carrier, and having circumferential play in its respective aperture in the other of the hub and carrier wherein a circumferentially acting auxiliary resilient member is arranged end to end with one of the aforesaid main resilient members and acts between said main resilient member and the carrier to provide for auxiliary vibration damping. Whilst the driven plate could be arranged with auxiliary resilient members acting one on each end of said main resilient spring to operate in both directions of rotation of the carrier about the hub it is preferable for the auxiliary resilient member to operate in one direction of rotation only.

Preferably the auxiliary resilient member operates only during the drive mode of operation

of the driven plate and not during the overdrive mode of operation.

By drive mode of operation is meant when a torque load is transferred from a vehicle engine to a transmission and by overdrive mode is meant when the torque load is transferred from the transmission to the engine for example when using the engine as a brake for the vehicle.

Whilst the resilient member could be springs or rubber bushes, conveniently the aforesaid resilient members are elastomeric, and the auxiliary resilient member is a compression type coil spring.

The invention will now be described by way of example and with reference to the following drawings in which:-

Fig. 1 is an elevation of a driven plate according to this invention showing one sector of the plate in section;

Fig. 2 is a section on the line II-II of Fig. 1;

Fig. 3 is a section on the line III-III of Fig. 1;

Fig. 4 is a section on the IV-IV of Fig. 1;

Fig. 5 is a graph of torque versus deflection for the herein disclosed driven plate;

Fig. 6 is an elevation of an alternative construction of driven plate with the retainer plate removed;

Fig. 7 is a section on the line VII-VII of Fig. 6; and

Fig. 8 is a section on the line VIII-VIII of Fig. 6.

With reference to Figs. 1 to 4, a friction clutch driven plate for an automobile friction clutch comprises a steel hub 11 having internal splines 12 for mating with the input shaft of a gearbox. The hub 11 has a glass-filled nylon 66 annular flange 13 moulded thereon. The flange 13 secured in position by projections 14 on the external surface of the hub 11.

A pair of co-axial friction facings 15 are bonded onto a reinforced polyether sulphone (P.E.S.) adaptor plate 16.

The adaptor plate 16 is injection moulded and is reinforced by glass fibre, carbon fibre or combinations of both. The adaptor plate 16 is co-axial with the hub 11 and is rotatably mounted on the hub 11 on one side of the flange 13. There are four circumferentially spaced axial projections 17 on the plate 16 which pass through apertures 18 in the outer peripheral margin of the flange 13. A co-axial annular retainer plate 19 is located on the other side of the flange 13 to the adaptor plate 16, and is secured rotationally fast to the adaptor plate 16 by bonding or welding to the projections 17. The retainer plate 19 is moulded from reinforced P.E.S. The adaptor and retainer plates 16 and 19 form a friction facing carrier that is capable of limited angular rotation relative to the hub 11, the rotation being limited by abutment of the projections 17 with the radial ends of the co-operating apertures 18.

The main drive damping means are provided by four elastomeric resilient members 21 which are each located in a respective set of aligned apertures 22 and 23 in the facing carrier plates 16 and 19 and hub flange 13 respectively. The elastomeric members 21 are hollow rubber cylinders, preferably styrene butadiene rubber, which are a

snug fit in the flange apertures 23 but have circumferential play in the facing carrier apertures 22. Two diametrically opposed elastomeric members 'C' have circumferential play in their respective carrier apertures 22 at both ends thereof, whereas the two other elastomeric members 'B' have circumferential play at the trailing end only of their respective apertures 22 that is, the trailing end with respect to the direction of rotation of the carrier about the hub during the drive mode by operation of the plate. The circumferential play 'P' at both ends of the member 'C' is substantially equal, and is also substantially equal to that at the trailing ends of the members 'B'.

Each of two elastomeric members 'B' is in end-to-end contact with an auxiliary spring 25. Each auxiliary spring 25 is housed within the adaptor and retainer plates 16 and 19 and an aperture 26 in the hub flange 13. The ends of the auxiliary springs 25, and the elastomeric members 21 are each supported by an end cap 27 each of which has a boss 30 that locates in the hub flange 13. End caps 27" are located between each pair of adjacent ends of an auxiliary spring 25 and its adjacent elastomeric

member 21 prevent direct contact therebetween and also serve to locate both. The face of the end cap 27" against which the spring 25 abuts is angled to provide a substantially flat surface for the auxiliary spring to abut against, and the spring 25 is located to act co-axially onto the adjacent elastomeric member 21. An end cap 27' at the other end of each auxiliary spring 25 abuts against both the hub flange 13 and internal shoulders 29 on the facing carrier plates 16 and 19.

Each auxiliary spring 25 is located at the trailing end of its respective elastomeric member 21 and biases the adjacent elastomeric members 21 against which it reacts against the leading radial end of its co-operating carrier aperture 22, so that to maintain the play 'P' between the trailing radial end of said aperture and the respective end cap 27" (Fig. 3). The end caps 27' locate in cut outs in the hub flange and are held in position by retaining pads 31 which clip into the flange (Fig. 4).

With the hub 11 held steady and the friction facings rotated, the driven plate operates in the following manner, with reference also to Curve 1 of Fig. 5:-

(a) When the friction facing carrier operates in the drive mode the facing carrier rotates clockwise in the direction of Arrow A and the initial resistance to rotation is provided by the auxiliary springs 25. After carrier plates 16 and 19 have moved to take up the clearance 'P' on the resilient members 'B' and 'C', the plates 16 and 19 then abut the end caps 27 of the said members.

(b) Further clockwise rotational movement results in all the resilient members 21 resisting the rotation. This continues until the clockwise movement is limited by the projections 17 abutting the ends of the apertures 18.

(c) If the friction facings are now rotated anti-clockwise the reverse operation takes place until the facing carrier plates pass through the original position.

(d) When the driven plate goes into the overdrive mode, then because there is no clearance on the one end of the resilient members 'B', and the auxiliary springs 25 are shorted out, because the cap 27" is held on the hub flange 13, then the members 'B' come into immdediate operation, and the members 'C' come into operation after the circumferential play 'P' has been taken up.

Whilst the driven plate has been described as having elastomeric resilient members, these could be replaced by conventional coil springs.

A modified driven plate is illustrated in Figs. 6 to 8, and only the differences compared with the previously described driven plates will be described. Those components which are similar to those in the previously described driven plate will be given the same reference numerals.

In the embodiment shown in Figs. 6 to 8, the elastomeric members 21 are arranged to be a snug fit in the spring apertures in the adaptor and retainer plates 16 and 19, and to have circumferential play in their respective apertures 23 in the hub flange 13. The elastomeric members 21 again have end caps 27 located one at each end thereof. In this case different circumferential clearances P1 and P2 are arranged between the ends of a spring and the adjacent edges of the aperture 23 in which the spring is housed. This will allow the shape of the load deflection curve to be altered as desired for example from Curve 1 to Curve 2 in Fig. 5.

Also the adaptor plate 16 and retainer plate 19 are now held together by rivets 51 and clips 52.

In the construction of the plate shown, the drive mode of the plate is when the carrier is rotated anticlockwise with respect to the hub 15 ie. in the direction of Arrow B and the auxiliary springs 25 are each located at the leading end of one of the elastomeric members during the drive mode operation of the driven plate. Each auxiliary spring 25 acts at one end directly against internal shoulders 29 on the corner and a shoulder 41 on the hub flange and at the other end against a cap 27" on the adjacent resilient member 21. In this construction the auxiliary spring 25 no longer cuts co-axially against the adjacent elastomeric member 21 but is offset radially outwardly.

During operation of the driven plate in the drive mode of operation the auxiliary spring compressed by relative movement between the plates 16 and 19, and the hub flange 13, until the end cap 27" abuts the flange, and in the overdrive mode of operation, the auxiliary spring is shorted out because the plates 16 and 19 operate directly against the end cap 27".

Claims

1. A clutch driven plate having a hub (11) with a flange (13) thereon, a co-axial friction facing carrier (16) and (19) mounted on the hub (11) and capable of limited angular rotation about the hub, and circumferentially acting main resilient members (21) each located in a respective set of aligned apertures (22) and (23) in the carrier (16) and (19) and flange (13) to resist said rotation, said resilient members each being a snug fit in its respective aperture (22) or (23) in one of the hub and carrier, and having circumferential play (P) in its respective aperture (22) or (23) in the other of the hub and carrier, characterised in that a circumferentially acting auxiliary resilient member (25) is arranged end to end with one of the aforesaid main resilient members (21B) and its other end acts against the carrier (16) and (19) to bias said main resilient member (21B) towards one radial end of its respective aperture (22) or (23) in which it has circumferential play.

2. A driven plate as claimed in Claim 1, characterised in that the auxiliary resilient member (25) is arranged to act only in one direction of rotation of the facing carrier (16) and (19) about the hub (11).

3. A driven plate as claimed in Claim 2, characterised in that two of the aforesaid main resilient members (21B) are each arranged end to end with an auxiliary resilient member (25).

4. A driven plate as claimed in anyone of Claims 1 to 3, characterised in that the aforesaid main resilient members (21) are elastomeric, and the auxiliary resilient member (25) is a compression type coil spring.

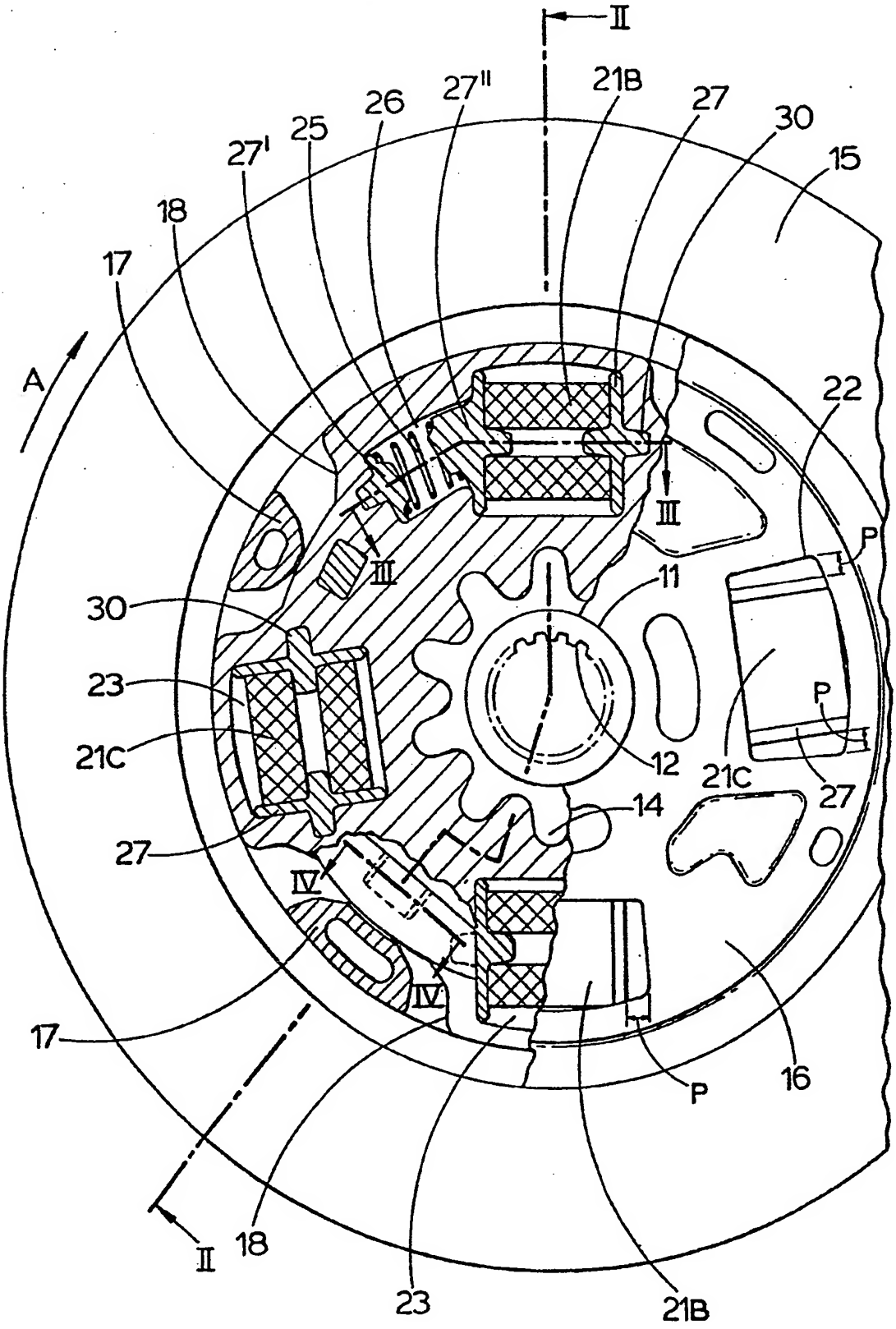
5. A driven plate as claimed in anyone of Claims 1 to 4, characterised in that an end cap (27") is located between the auxiliary member (25) and one of the aforesaid main members (21B) so that said members (21B) and (25) do not directly act against each other, said end cap (27") providing support and located for adjacent ends of said members.

6. A driven plate as claimed in Claim 1, in which the facing carrier comprises an adaptor plate (16) which carries the friction facings (15) and is located on one side of an annular flange (13) on the hub member (11), and a retainer plate (19) located on the other side of

the flange (13) and secured to the adaptor plate (14), characterised in that the auxiliary resilient member (25) is located within the two plates (16) and (19).

7. A driven plate as claimed in Claim 2, and anyone of Claims 3 to 6, when dependant upon Claim 2, characterised in that the auxiliary resilient member (25) operates only in the drive mode of operation of the driven plate and not in the overdrive mode.

8. A driven plate as claimed in Claim 7, when dependant upon Claim 5, characterised in that the auxiliary resilient member (25) is shorted out in the overdrive mode of operation by abutment of the end cap (27") with one of the hub (11) or carrier (16) and (19) so as to bridge the auxiliary member (25).


II
27II
21B
26
27
25
30
27I
15
18
17
A
22
III
III
P
30
11
23
21C
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21C
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IV
IV
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Fig.1

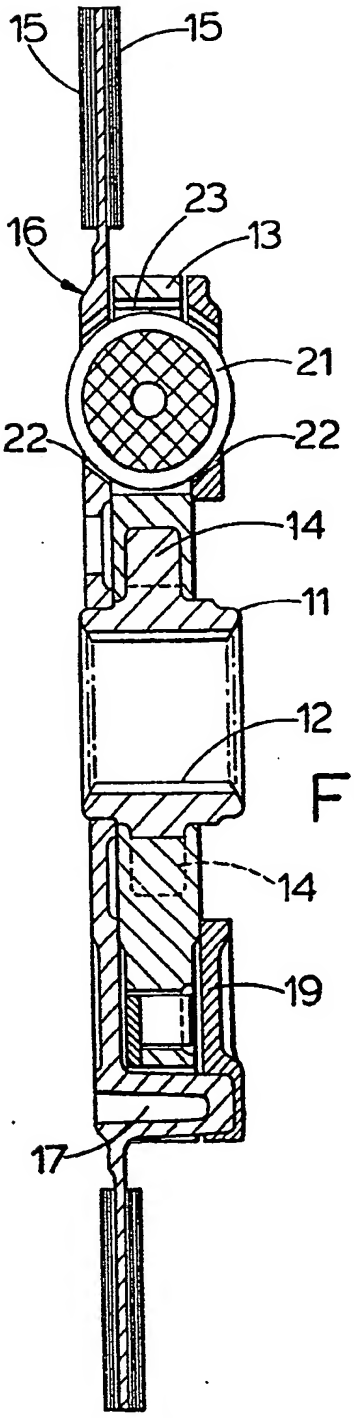

Fig.2

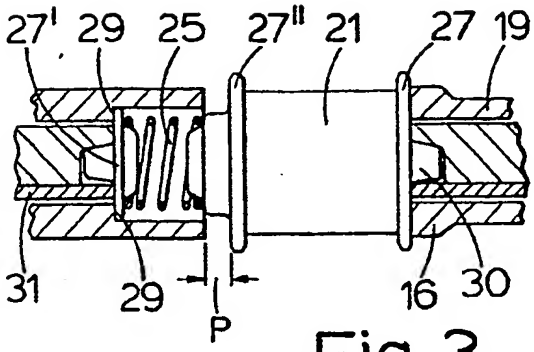

Fig.3

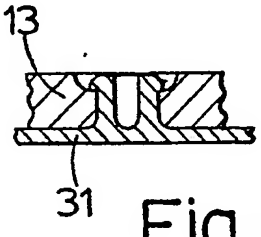

Fig.4

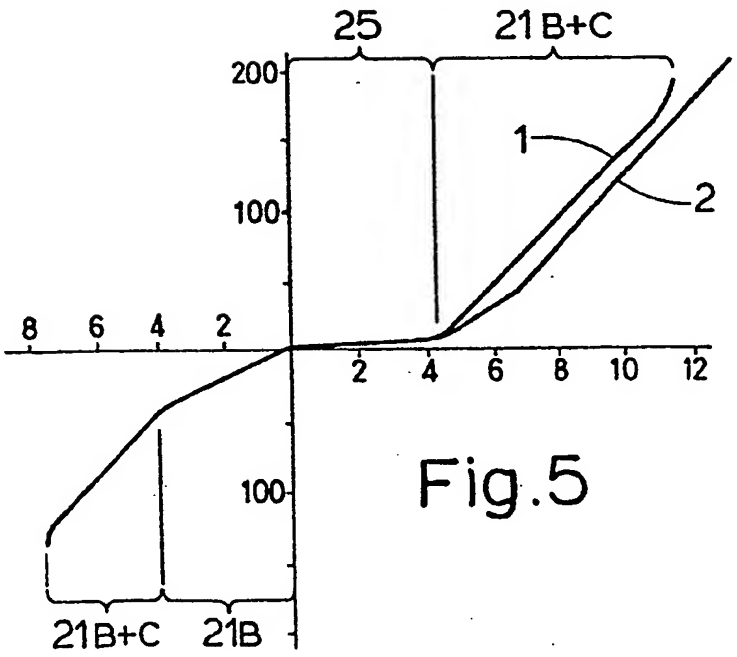

Fig.5

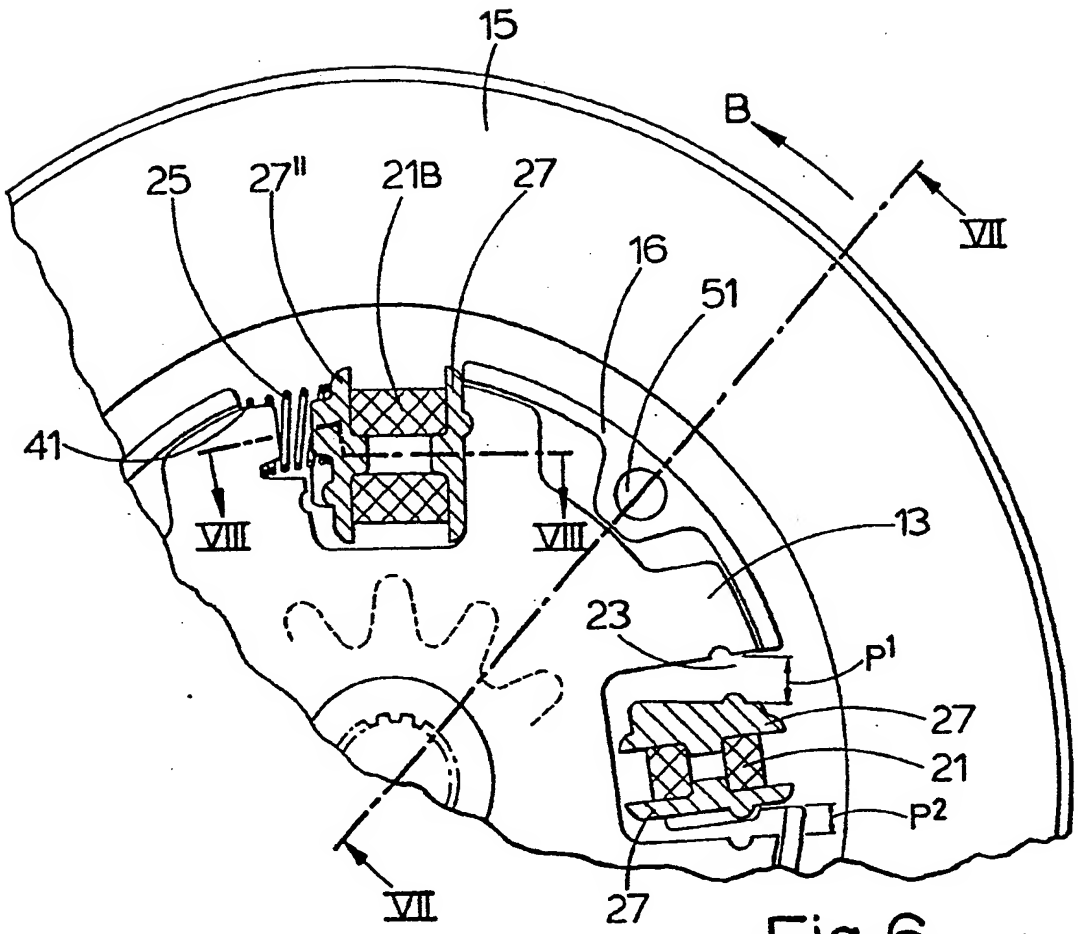

Fig.6

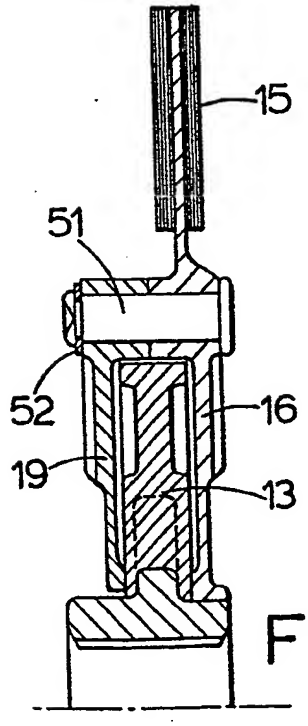

Fig.7

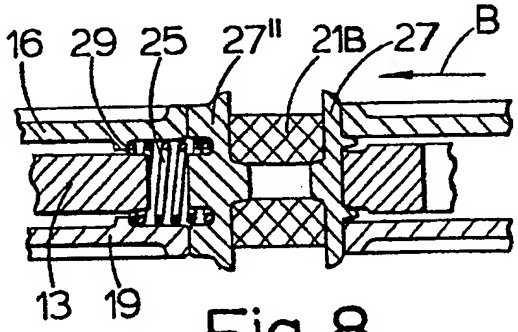

Fig.8

European Patent Office

EUROPEAN SEARCH REPORT

0070099

Application number

EP 82 30 3042

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Y	FR-A-2 387 384 (VEB) *Page 8, lines 7 to 12; figure 4*	1,3,4,5	F 16 D 13/68
Y	US-A-3 809 198 (MORI) *Column 2, line 24 to column 3, line 17*	1,4	
A	FR-A-2 020 215 (FICHTEL-SACHS) & GB - A - 1 233 273 (Cat. D)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

F 16 D
F 16 F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05-10-1982	BARON C.

CATEGORY OF CITED DOCUMENTS

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